

Claims

1. A system for resequencing per flow data packets received by the at least one destination egress adapter comprising:

means (271) for allocating a temporary storage location (ID)
5 in a packet buffer to each received data packets;

means (510,550) using predefined parameters for pointing to an output register (540) previously assigned to corresponding flow of each received data packet, and

means (270) coupled to the allocation means and to the
10 pointing means for determining if each received data packet is the next in sequence of the corresponding flow, by comparing the packet sequence number (PSN) of said each received data packet to the last packet sequence number (PSNc,PSNh) used by the pointed output register.

15 2. The system of claim 1 wherein the means for pointing to an output register comprise a first Content Addressable Memory (510) wherein each entry (512) includes a search field (515) having a source identifier, a routing index and a priority level, and an associated identifier field including a Cross
20 Reference Index (520) to point to a previously assigned output register among a plurality of output registers (500).

3. The system of claim 2 wherein the identifier field further contains an activity identifier (521) to indicate when a previously assigned output register is no longer active, and
25 a packet sequence number (522) equal to the last packet sequence number received for the corresponding flow.

4. The system of claim 2 wherein the means for pointing further comprise means (550) for assigning a new output register to each new flow of data packets.
5. The system of claim 2 wherein the first Content Addressable Memory further comprises means (514,523) for preventing over filling of said first Content Addressable Memory.
6. The system of claims 1 or 2 wherein the determination means further comprise a second Content Addressable Memory (400) wherein each entry including a source identifier (415), a routing index (420), a priority level (425) and the packet sequence number (430) of each stored data packet, and an associated identifiers field (435) to give a packet buffer identifier (ID) that identifies the storage location allocated to each received data packet.
7. The system of claim 1 wherein the output register (540) further comprise:

a packet sequence number (501) and a packet buffer identifier (502) of an in-process data packet; and

a valid-bit latch (505) to set an active/not active status that indicates if the in-process data packet is already output.
8. The system of claim 7 wherein the output register further comprise a count (503) to maintain a value for each flow the number of data packets stored in the packet buffer waiting for being output.

9. The system of claim 7 further comprising scheduling means (280) coupled to the determination means for selecting one of the in-process data packets to be output.
10. The system of claim 9 wherein the scheduling means is
5 coupled to each of the valid-bit latches to select one valid-bit latch having an active status.
11. The system of claims 1 or 2 wherein the allocating means (265) comprise a free buffer list (470) to allocate a free temporary storage location (ID) to each received data packet.
10 (460).
12. The system of claims 1 or 2 wherein the data packets comprise unicast and multicast data packets.
13. The system of claim 1 further including at least one ingress adapter comprising counting means (210,360,385) for
15 sequentially numbering data packets of a same flow.
14. The system of claim 13 wherein the ingress adapter further comprises means (205) for load balancing over a plurality of independent switching planes the data packets.
15. The system of claim 14 wherein the at least one ingress
20 adapter further comprising means (220) for scheduling the switching of the data packets over the plurality of independent switching planes.
16. A method for resequencing per flow the data packets received by the at least one destination egress adapter
25 comprising:

(605) allocating a temporary storage location in a packet buffer to each received data packet;

(610) extracting predefined parameters using the predefined parameter to search a memory and identifying a cross
5 reference index therefrom;

using the Cross Reference Index associated to each received data packet to point (625) to a respective output register previously assigned to the corresponding flow of each received data packet; and

10 comparing (640) the packet sequence number of each received data packet to a packet sequence number stored in the respective pointed output register to determine if said each received data packet is the next in sequence.

15 17. The method of claim 16 further comprising:

assigning (660) a new output register and a new Cross Reference Index if no associated Cross Reference Index is found (617) for a received data packet; and

20 storing (690) in the new output register the packet sequence number (PSN) of said received data packet.

18. The method of claim 16 further comprising checking if the assigned output register is active.

19. The method of claim 18 further comprising:

assigning (650) a new output register if the assigned output register is found inactive;

comparing (655) the packet sequence number of the received data packet to the last packet sequence number used by the inactive assigned output register; and

storing (690) in the new output register the packet sequence number (PSN) of said received data packet if it is the next in sequence, otherwise

storing (670) in the new output register the last packet sequence number (PSNh) used by the inactive assigned output register.

20. The method of claims 16 or 17 further comprising releasing the unused Cross Reference Index after a predetermined time value.

15 21. The method of claim 19 wherein the assigned output registers further comprise a packet buffer identifier that identifies the storage location (ID) allocated to each received data packet.

20 22. The method of claims 16 or 17 further comprising writing in a Content Addressable Memory, the source identifier, the priority level and the packet sequence number of each received data packet that is not the next in sequence, the write address being identified by the storage location allocated to said each received data packet.

23. The system of claims 1 or 16 wherein the predefined parameters include Priority Level (PTY), Routing Index (RI) and Source Identifier.

24. A method comprising:

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providing a plurality of registers with each register associated with a flow:

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providing a cross reference table with each entry associated with a register within said plurality of registers;

receiving a packet;

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searching the cross reference table with parameters selected from the packet;

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if a match is found, correlating at least one parameter identified in a register associated with said matching entry with parameter in the packet to determine sequence of said packet relative to a packet identified in said associated register.

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25. A method of claim 24 further including if a match is not found making a new entry for said packet in said cross reference table and associating a register from said plurality of registers with said packet.

26. The method of claim 24 further including if packet is in sequence with packet identified in said associated register

setting a valid bit to post request for service to egress scheduler.

27. The method of claim 24 further including if packet is out of sequence relative to packet identified within said
5 associated register reset a valid bit indicating no request is posted to egress scheduler.

28. A program product comprising:

10 a computer useable medium having computer readable code stored therein, said computer readable code including a first instruction module with instructions to examine a packet and extract a set of predefined parameters therefrom;

15 a second instruction module with instructions that uses the extracted predefined parameters to search an index table having each entry associated with a register;

20 a third instruction module having instructions to correlate parameters in said packet with parameters stored in an associated register to determine sequence of said packet to packet identified in said register if a match is found in said index register.

29. The program product of claim 28 further including a fourth instruction module including instructions for adding an
25 entry for said packet to the index table if a match is not found.

30. An apparatus comprising:

a plurality of switching planes;

a buffer for storing packets transported through said switching planes; and

5 a system for ensuring packets are in predefined sequence, said system including a register stack wherein each register is associated with a flow;

10 a cross reference index table with each entry associated with a register; and

a controller that selects parameters from a received packet to search the index table and determine sequence of said packet relative to a packet identified in a register
15 associated with a match entry.